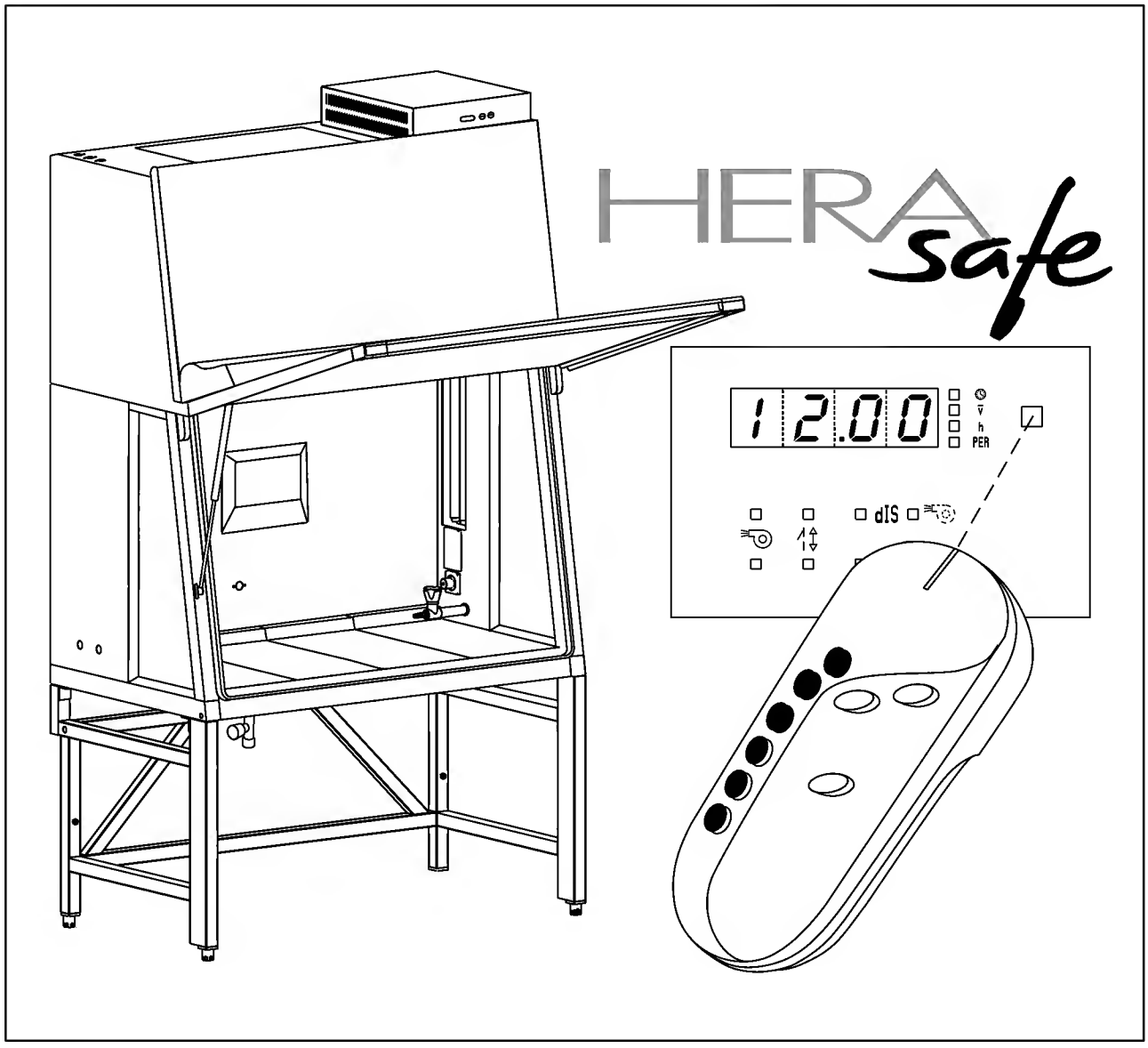
Kendro®

# Operating Instructions

**Safety Cabinet HERAsafe KS**

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# 1. General notes

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## 1.1 Safety instructions

These safety instructions describe the safety features of the HERAsafe series and apply to the models KS 9/12/15/18.
The safety cabinet has been manufactured in keeping with the latest technological developments and has been tested before delivery for its correct function. It may, however, present potential hazards if it is not used according to the intended purpose or outside of operating parameters. Therefore, the following procedures must always be observed:

- The safety cabinet must be operated only by trained and authorized personnel.
- For any operation of this unit, the operator must prepare clear and concise written instructions in the language of the operating and cleaning personnel based on these operating instructions, applicable safety data sheets, plant hygiene guidelines, and technical regulations, in particular:
  - which decontamination measures are to be applied for the cabinet and accessories,
  - which protective measures apply while specific agents are used,
  - which measures are to be taken in the case of an accident.
- Repairs to the device must be carried out only by trained and authorized expert personnel.
- The contents of the operating instructions are subject to change without further notice.
- Concerning translations into foreign languages, the German version of these operating instructions is binding.lease
- Keep these operating instructions close to the unit so that safety instructions and important information are always accessible.
- Should you encounter problems that are not detailed adequately in these operating instructions, please contact Kendro Laboratory Productsimmediately for your own safety.

# 1. General notes

## 1.2 Warranty

Kendro Laboratory Products warrant the operational safety and functions of the safety cabinet only under the condition that:

- the device is operated and serviced exclusively in accordance with its intended purpose and as described in these operating instructions,
- the device is not modified,
- only original spare parts and accessories that have been approved by Kendro Laboratory Products are used,
- inspections and maintenance are performed at the specified intervals,
- an installation test is performed prior to the initial operation of the device and that a repeat test is performed on the occasion of all inspections and repairs.

The warranty is valid from the date of delivery of the device to the operator.

## 1.3 Explanation of symbols

### 1.3.1 Symbols used in the operating instructions:

**WARNING!**

**is used if non-observance may cause serious or even lethal injuries.**

**CAUTION!**

**is used if non-observance may cause medium to minor injuries or damage.**

**NOTE!**

**is used for hints and useful information**.

**RECYCLING!**

**Valuable raw materials can be reused.**

# 1. General notes

### 1.3.2 Symbols on the device:

**Observe operating instructions**

**High Voltage (electrical cover)**

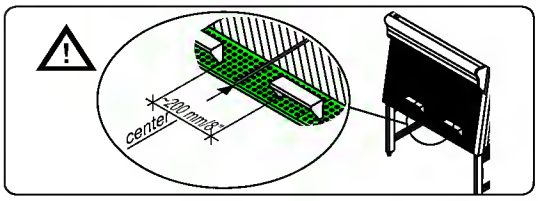
**Biohazard (left front of unit)**

**NSF symbol (illumination box cover)**

**ETL symbol (illumination box cover)**

**TSA note (outlet cap in sample chamber)**

**RS 232 interface (connection label)**




**Installation armrests**

# 1. General notes

## 1.4 Use of the device

### 1.4.1 Correct use

The safety cabinet is a laboratory device for installation and operation in microbiological and biotechnical laboratories of safety levels 1, 2, and 3. It has been designed as a Class II safety cabinet, Type A/B3, in accordance with NSF, Standard 49/1992.
Depending on the hazard level of the agents involved, the operator must prepare in writing appropriate decontamination procedures for the device and the accessories used in the sample chamber.

Prior to the initial operation of the cabinet, the operator should perform an installation test. The test result must be documented by a test report. The cabinet must only be released for operation if it is in compliance with the operating parameters specified by Kendro Laboratory Products.

After any changes to the installation conditions or after any modification to the technical system, a repeat test must be performed and the test result must be documented by a test report that shows that all operating parameters are in compliance with those specified by Kendro Laboratory Products.

### 1.4.2 Incorrect use:

The safety cabinet must not be used in laboratories that do not comply with the requirements of safety levels 1, 2, and 3.
The unit must not be operated as a Class II safety cabinet, Type A/B3, if:

- no repeat test is performed after changes to the installation conditions or after modifications to the technical system,
- the alarm system of the device has issued a failure message and the cause for the failure has not been repaired.

The alarm system must not be tampered with or disabled. If alarm system components heve been removed or disabled for service or repairs, the unit must only be released for operation if all alarm system components are functioning again properly.

The filters installed in the device are not capable of separating gaseous substances. Therefore, do not work with or store substances in the device:

- that in quantity or concentration are toxic,
- if a reaction with other substances may result in hazardous toxic concentrations or formation of toxic gases,
- that may form combustible or explosive mixtures in combination with air.

# 1. General notes

## 1.5 Standards and safety regulations

The device complies with the safety requirements of the following standards and guidelines:

USA / Canada
- IEC 1010-1 / UL 3101-1
- NSF, Standard 49/2002

Europe / Middle East / Africa
- IEC 1010-1 / EN 61010-1
- EN 12469 / 2000
- Low Voltage Directive 73/23 EWG
- EMC Directive 89/336 EWG

Australia / Asia / Pacific
- IEC 1010-1
- AS 2252.2

# 2. Delivery

## 2.1 Standard components

Delivery for the safety cabinet includes the following:

- safety cabinet,
- remote control,
- drain valve.

- Device documentation:
  — operating instructions,
  — factory test report.

Optional components and accessories are listed as separate items in the delivery document.

## 2.2 Acceptance inspection

After the device has been delivered, immediately check the device:
- for completeness,
- for possible damage.

**If the delivery is incomplete or if you detect any transport damage to the device, contact the forwarding agency and Kendro Laboratory Products immediately.**

# 3. Installation

## 3.1 Ambient conditions

The operational safety and correct function of the unit depend on the location where it is to be operated. The safety cabinet must be operated only at locations that meet the ambient conditions listed below.

**Location requirements:**

- The electrical system of the device has been designed for an operating height of up to 6500 ft above sea level.
- The mains power supply outlets should be out of casual reach to prevent accidental shut-off. Ideally, the outlets should be installed above the safety cabinet.
- The flooring of the location must be adequately strong and not flammable.
- The room in which the device is installed must be of adequately height. For units not connected to an exhaust system, the distance between the exhaust air opening and the room ceiling must be at least 200 mm (8 in).
- The location must be equipped with an appropriate ventilation system (see Section 3.2.).
- The temperature within the room must be between 15° C and 40° C (49° F and 104° F).
- The relative humidity in the vicinity of the device must not exceed 90 %.

**NOTE - Ambient conditions!**

**If ambient conditions vary from those described above, please contact Kendro Laboratory Products for assistance in installing the device.**

**NOTE - Temporary storage!**

**If the device is stored only temporarily (up to four weeks), the ambient temperature may be between -20° C and +60° C (-4° F and +140° F) at a relative air humidity of up to 90 %. For longer storage periods, the location requirements apply.**

## 3.2 Room ventilation

The room ventilation should preferably be a ventilation system that complies with the national requirements for the application.

- The inlet air and exhaust air openings of the room ventilation must be located so that drafts are prevented from impairing the function of the safety cabinet air system.

# 3. Installation

## 3.3 Correct location

Choose a draft-free location where the safety cabinet does not interfere with the plant traffic.
**Fig. 1:** This figure shows preferred locations for safety cabinets and unsuiable locations, not in accordance with the safety requirements.
**Unsuitable locations:** The locations [1], [2], and [3] are not suitable because they are exposed to drafts from windows and doors.
Location [5] is undesirable because it is in range of plant traffic and within the exhaust air range of a ventilation system [4].
Preferred locations [6], [7], and [8] are correct because they are in a draft-free section of the room and not exposed to plant traffic.

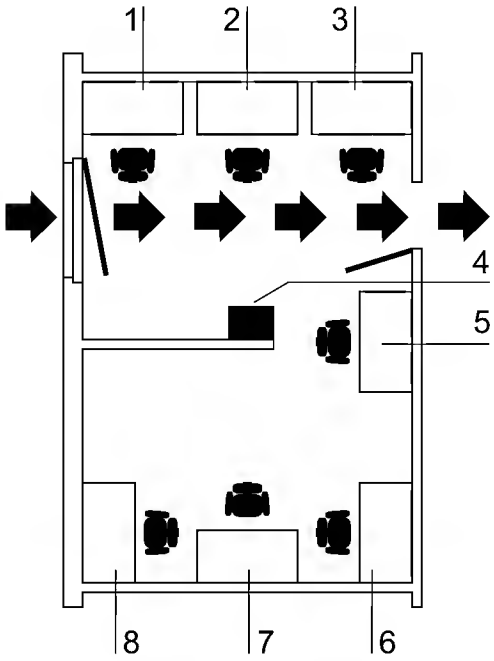



Fig. 1
Locations in a room

## 3.4 Installation in series

When several devices are to be installed in series, please observe the following:

- Make sure that vibrations cannot be transferred between adjacent units.
- Exterior surfaces of the cabinets must always be accessible for cleaning and disinfection.

## 3.5 Transport

**Fig. 2:** To prevent the unit from tipping, always transport using a suitable carrier, even for a transport within a building, and separate the unit from the stand.

**NOTE – Lift points**

**For transport, lift the unit only at the lift points shown in Figure 2.**
**Do not allow the weight of the cabinet to rest on the floorpan!**

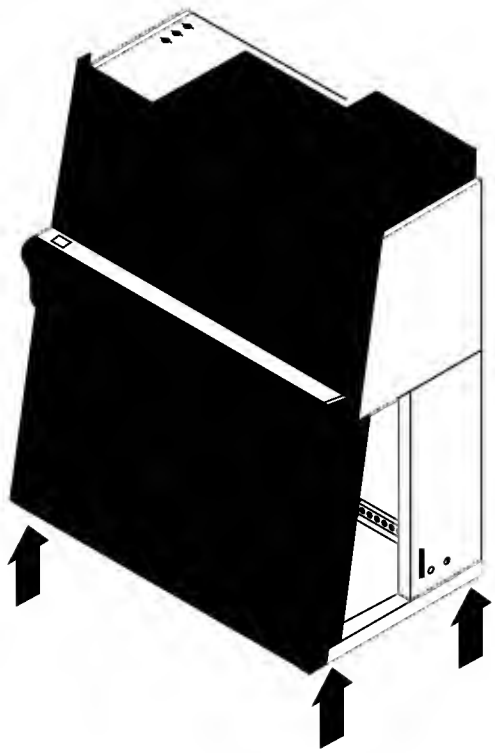


Fig. 2
Lift points

# 4. Description

## 4.1 Overall view

- **Fig. 3:** Plenum [5] (assembly containing blowers and filters) with downflow blower [24] and exhaust air blower [2]. The device downflow filter and the exhaust air filter are installed with the corresponding blowers. Exhaust air is released through the opening [1].
- Optional media lines [25] are routed into the sample chamber [20] at the side of the plenum.
- Electrical box [4] with power supply cable [3]. At the front of the electrical box are a connection for an RS 232 interface for connecting a PC, as well as two fuse holders installed.
- Front cover [6] with electrically operated front window [7] and gas strut [22] for support when open.
- The illumination system [23] with two tubes is part of the front cover assy.
- Side slates [9] with two sealed access openings [19]. These can be equipped with media valves [13].
- Internal outlets [10] for power supply of accessories and adapter [11] for mobile UV device.
- Optional UV lamp unit [8] consisting of two UV lamps per side.
- Optional stands [12], adjustable in height (KFS 2) and with fixed height (KFS 1).
- Workplate segments [15] with optional arm rests [16]. A one-piece workplate and special workplates are available options.
- Drain valve [17] for installation into floorpan.
- Display [21] with remote control sensor and alarm system LEDs.
- Test hoses for the supply unit [18] at the left side of the sample chamber and for the exhaust unit [14] at the right side of the sample chamber.

**NOTE – Test hoses!**

**Do not remove the two test hoses for checking downflow and exhaust air.**

# 4. Unit description

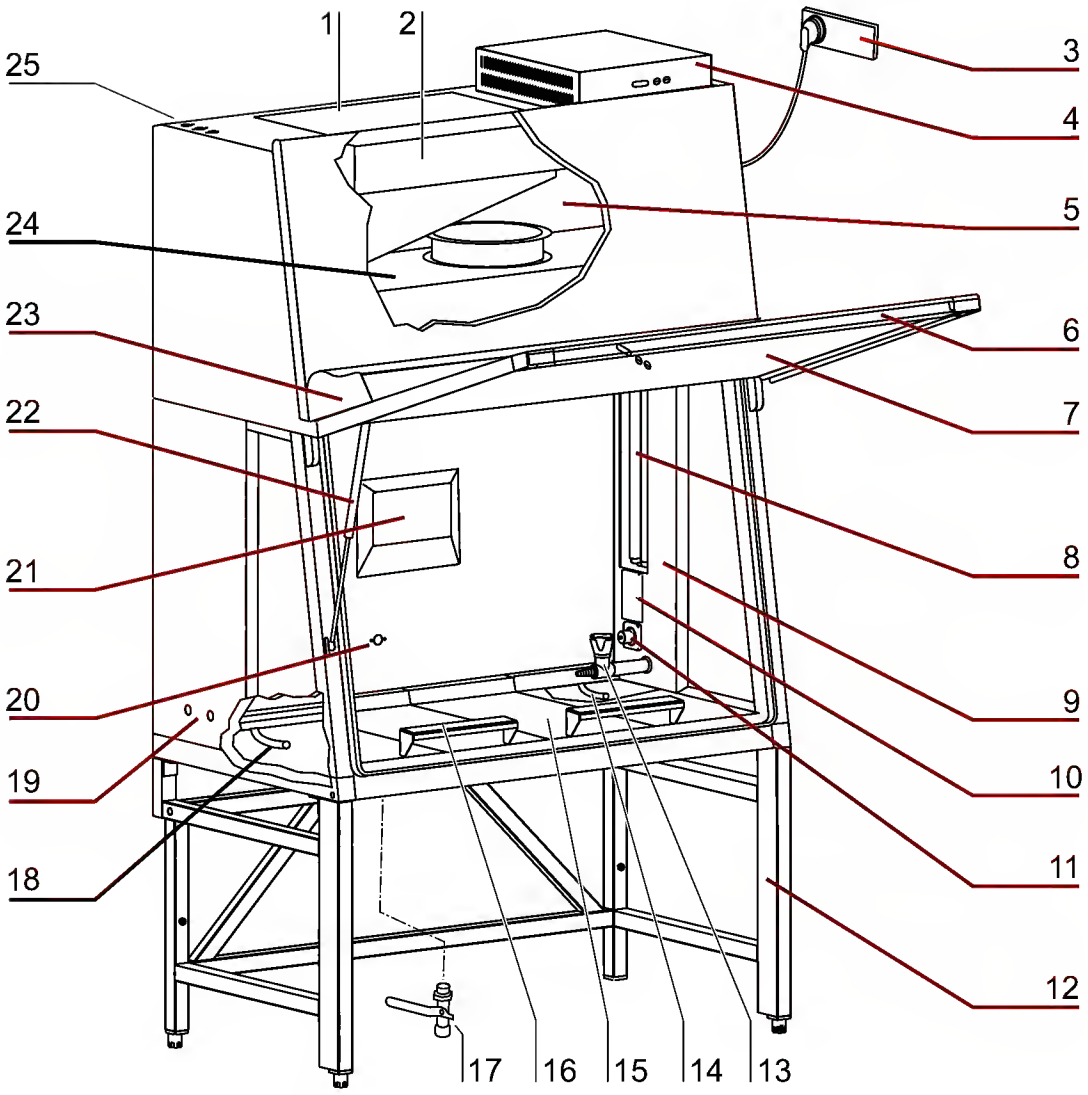



Fig. 3
Overall view

# 4. Unit description

## 4.2 Safety system

The safety system comprises a combination of protective and alarm systems that ensure maximum personal and material protection.

**Safety systems:**

- **Vacuum-sealed air system**
  A vacuum-sealed air system in combination with ULPA filters for downflow and exhaust air forms the basis of the safety system for personal and material protection.
- **Personal protection**
  Air aspired from the exterior along the entire working opening at a constant high velocity prevents that:
  - agents may leak through the working opening of the chamber.

  As the exterior air pressure around the unit exceeds the pressure of the internal air system (vacuum sealing), it is ensured that:
  - agents cannot be released to the exterior in the case of a leak in the cabinet housing.
- **Material protection**
  A steady airflow within the air system ensures that:
  - a constant downflow allows the ULPA filters to remove contaminants so that the samples are always surrounded by ultrapure air,
  - harmful particles are not carried over through the sample chamber (protection from cross-contamination).
- **ULPA filters**
  The downflow (i.e. the air circulating within the device) and the exhaust air (air that is released to the exterior) are cleaned by ULPA filters (ULPA = Ultra Low Particle)
- **Safety lockout**
  To protect from UV radiation, the optional UV disinfection routine can be run only if the front opening is closed. During UV disinfection, the front opening safety lockout is activated and prevents harmful UV radiation from being emitted from the sample chamber.

**Warning system:**

- **Airflow monitoring**
  Airflow monitoring determines the velocity of the airflow in the sample chamber as well as the inflow velocity of the air aspired from the exterior through the working opening. As soon as airflow velocities move above or below a specified safety value, a signal is transmitted to the alarm system.
- **Visual and audible alarm system**
  The warning system constantly monitors the safety-relevant device functions:
  - Inflow velocity of the air aspired from the exterior,
  - downflow velocity,
  - working position of the front window.

  If the warning system detects changes to one of these device functions, it issues:
  - an audible and a visual alarm signal.

# 4. Unit description

- **Position monitoring**
  The position sensors monitor the position of the front cover as well as the movement of the front window; it will indicate when the front window is in the working position.
- **Kendro Performance Factor**
  The Kendro Performance Factor (PER) is a value that indicates the safety state of the safety cabinet. This value is calculated from data determined by the safety system and from values captured empirically by service personnel during safety checks. This data is entered into a parameter list of the control software and interconnected. The result can be indicated by the display.

## 4.3 Filter system

**Fig. 4:** The filter system consists of two ULPA filters [2] and [5] for the circulating air and for the exhaust air and of a coarse filter for the aspired air.

**ULPA filters:** Room air [10] is drawn into the sample chamber through the working opening. In the air duct, room air and the downflow within the chamber [7] are then blended to make up the blend air [9]. The blend air is then:

- filtered proportionally by the downflow filter [5] and supplied as ultrapure air [6] evenly into the sample chamber of the device,
- filtered by the exhaust air filter [2] and released as ultrapure air [1] to the exterior of the device.

**Inlet air protection:** The air duct between the sample chamber and the device plenum has an inlet air protection [8] below the working surface to prevent coarse particles from entering the plenum where they may impair blower [3] und [4] and filter functions.

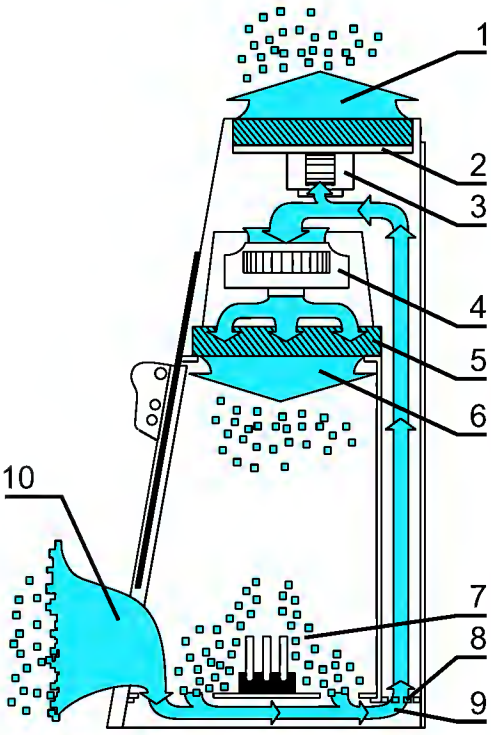



Fig. 4
Filter system with downflow filter and exhaust air filter

# 4. Unit description

## 4.4 Controls and display

**Fig. 5:** The safety cabinet is equipped with two separate control elements that operate independently of each other:
- remote control [3],
- pilot switch [1].

The status indicators of the display [2] indicate control operations initiated with the control elements.

**Remote control**: All device functions can be activated and deactivated easily using the remote control.

**Pilot switch:** Use to control all basic functions required for the operation. This switch allows you to operate the safety cabinet if the remote control is not operational or available.

**Fig. 6, display:** The display [2] can show text or numeric values and has 12 LEDs to indicate the current operational state of the unit.
The display module also houses the sensor system for the remote control. The pulses transmitted are best received by the sensor if the distance **A** between the remote control [5] and the sensor [3] does not exceed 1m and if the radio signal beam does not deviate more than 15° horizontally.
The transmission range of the remote control also depends on the battery state of charge.

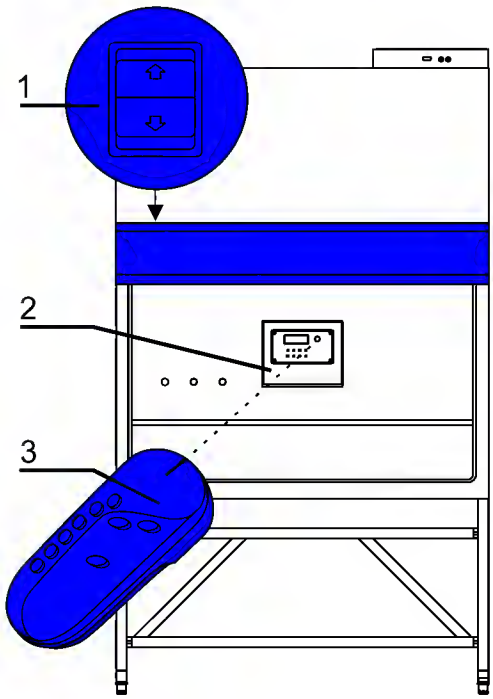



Fig. 5
Controls and display

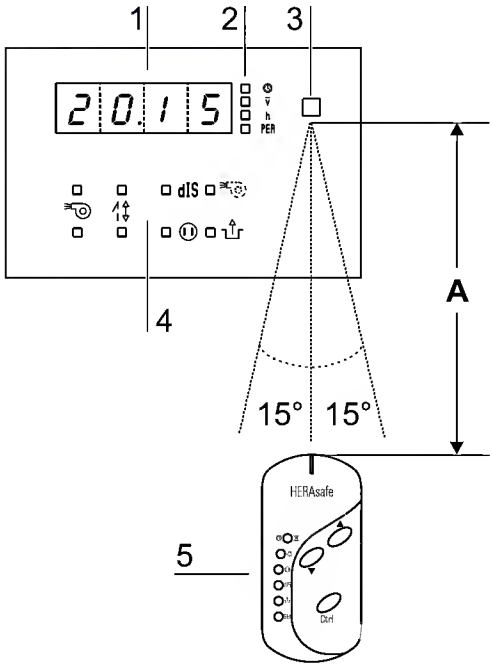



Fig. 6
Display with remote control sensor

# 4. Unit description

## 4.5 Sample chamber access

The sample chamber of the device is accessible via two modes:

- **Fig. 7:** Manual opening of the front cover [2] allows access to the complete sample chamber width with an opening height **C**. It is generally needed for decontamination and introduction of larger accessories.
- The electrically operated front window [1] is made of multi-layer safety glass and integral to the front cover frame. It can be raised to a maximum opening height **B**. To access the sample chamber during the work process, the front window must stay in the work position with opening height **A**.

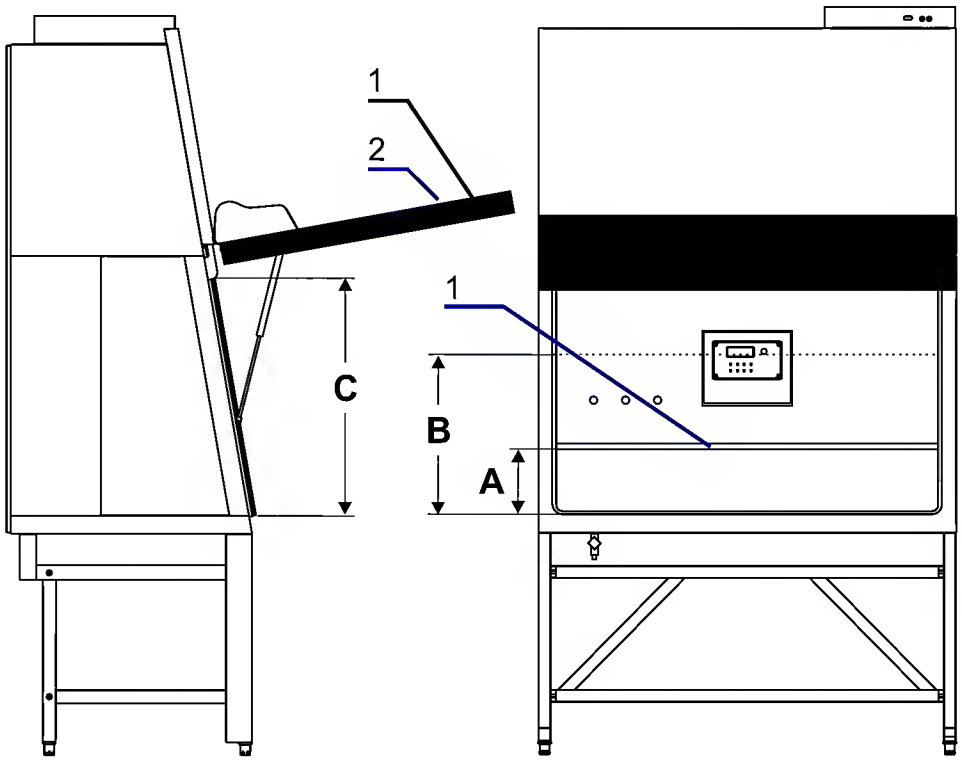



Fig. 7
Access through front cover and front window

**CAUTION – Front window movement!**

**Do not attempt to move the front window manually as otherwise the motor drive may be damaged.**

**NOTE – Front cover lockout!**

**The front cover is equipped with a safety lockout and can only be opened in standby mode, i.e. when the front window is completely closed.**

# 4. Unit description

## 4.6 Device interfaces

**Fig. 8:** The standard equipment includes the outlets [11] for internal power supply as well as the openings [8] on both sides for routing of cables and hoses. All other supply connections are available as options and may also be retrofitted.

**Power supply connection:** The connection to the power supply system is achieved through a cable with grounding plug [2] at the rear of the electrical box.

**Internal power supply:** The front of the box has an RS 232 interface [3] for the connection to a PC as well as two fuse holders for 5A miniature fuses:
[4] for (L),
[5] for (N).

☞ **NOTE – Electrical data of internal outlets!**

**Rated voltage: 1/N/PE AC, 115 V / 60 Hz.**
**Fusing: T 5 A.**
**Maximum leakage current: 0.5 mA**

**Other connections:** At the rear of the electrical box there are two connections for a potential-free contact [3] and [4] as well as an RS 232 connection [5] for a PC.

**Media valves:** There are two feed throughs [8] sealed with screw locks [9] on each side. These may be used for installation of media valves [7].

☞ **NOTE – Inlet pressure!**

**Inlet presssure for media valves is: max. 6 bar.**

**Media supply lines:** Additionally, media can be supplied into the sample chamber through three pipes. The inlets [1] are located on top of the housing, the outlets [6] are placed at the sample chamber backpanel.

**Disinfection adapter (optional):** The disinfection adapter [10] is used to connect a mobile UV radiation device. The adapter is connected to the device control, the UV disinfection routine with a mobile UV device may be controlled with the remote control.

# 4. Unit description

**Media connections (optional):** The media supply unit consists of three pipes that are routed into the sample chamber through the top of the unit. The inlet connections [1] and outlet connections [6] with thread (R 3/8"), e.g. for media valves [7], are preinstalled and equipped with a sealing plug.
The media connections are universal-type connections. Two equipotential bonding connections are installed at the top of the unit and at the stand.

**Caution – Combustible gas!**

**If a gas burner is to be operated in the sample chamber, an appropriate shut-off device for the gas supply system (shut-off valve, solenoid valve) must be installed.**
**Use only laboratory safety burners in the sample chamber.**

**External systems:** A failure detection systems or gas supply solenoid valves may be connected to the safety cabinet control. The unit may also be connected to an external ventilation system. These external systems can then be enabled or disabled in the secured operating mode using the remote control.

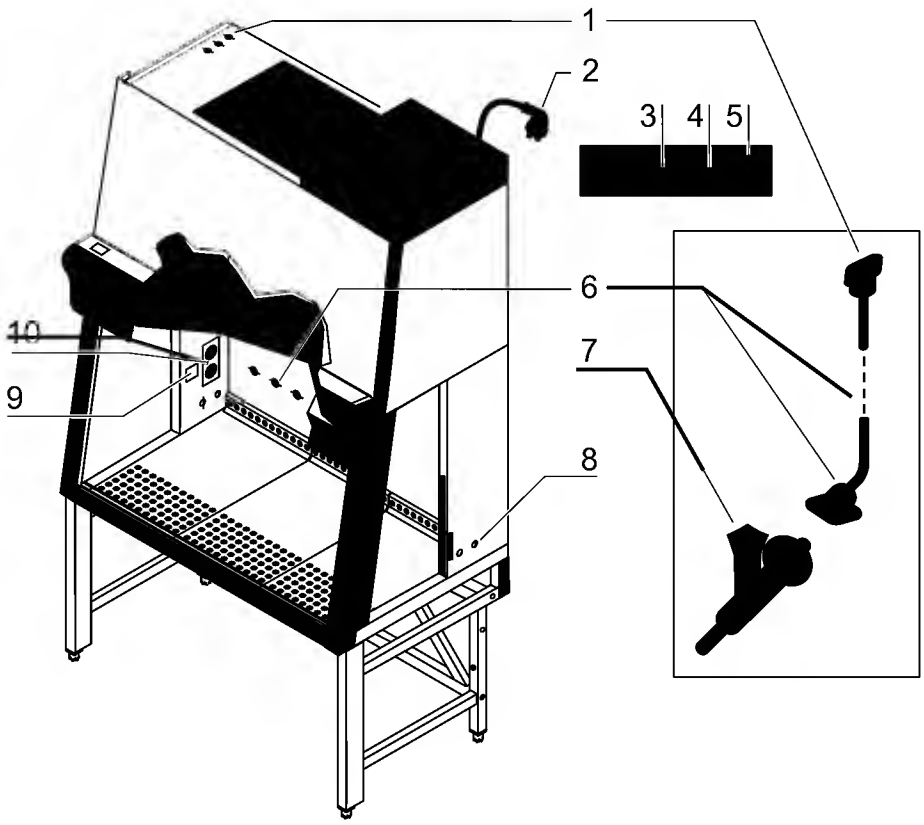



Fig. 8
Supply interfaces

# 4. Unit description

## 4.7 UV lamp unit

**Fig. 9:** The UV lamp unit (optional) consists of two lamp housings [2] with two UV lamps each [1] that are integral to the side walls. Both lamp housings are protected by a stainless steel cover [3].
By cross-radiation of the UV units, all surfaces will be disinfected as the shadow zone is reduced.
The operating time of the UV lamps is preset. The UV disinfection routine can be activated quickly by using the remote control.

**NOTE – Protection from UV radiation!**

**As a protection from harmful UV radiation, the UV lamps can only be activated if the front window is completely closed.**

## 4.8 Working area

The standard equipment consists of the segmented workplates. One-piece or special workplates are available as options.

**Fig. 10:** The working area **A** for perfect material protection extends over the entire width **B** and depth **C** of the workplate. The two optional arm rests [3] are positioned at a distance D (20 cm) to each other centrically on the workplate [1] or on the workplate segments. The armrests are installed to the second perforation line [2] of the workplate.

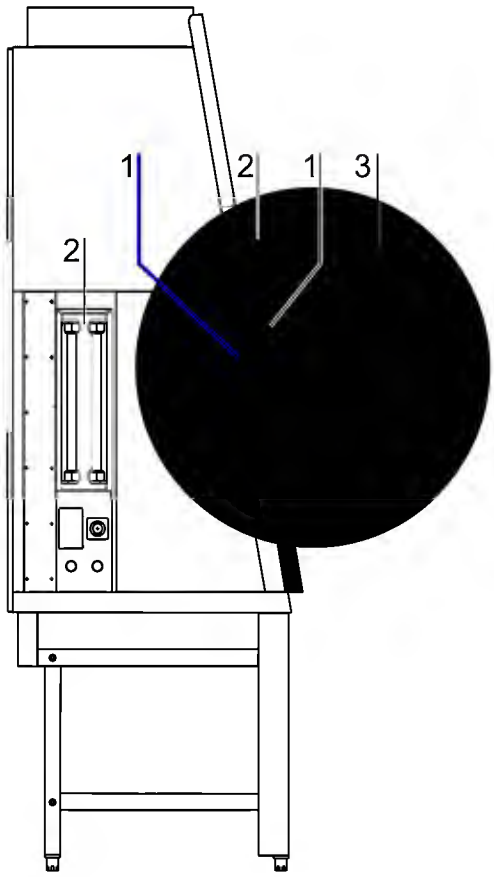



Fig. 9
UV lamp unit

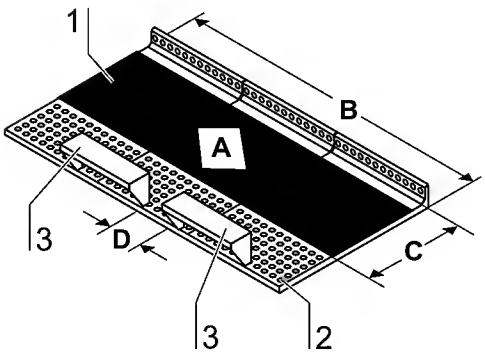



Fig. 10
Working area on the workplate, arm rests

# 5. Start-up

## 5.1 Initial operation

Prior to initial operation, the safety cabinet must be subjected to an installation test. Correct assembly and installation performed by the operator are essential for good start-up.

## 5.2 Installing unit and accessories

- Place the cabinet onto a sufficiently strong support. Do not allow the weight of the unit to rest on the floorpan.
- Remove the protective foil from the floorpan.

Assembling the optional stand and Installing the device to the stand:

1. **Fig. 11:** Install the two side members [3] to the rear support [4] using the screws [5].
2. Place the safety cabinet on the stand with the guide pins [7] positioned properly in their receptacles in the stand.
3. Install the housing to the vertical posts of the stand with the retaining screws [8].
4. Align the safety cabinet working area. Place a bubble level onto the workplate and use a wrench (size 24 mm) to rotate the rack stands [6] so that the workplate is perfectly horizontal in all directions. When adjusting the rack stand height, proceed from left to right and from rear to front.

**Drain valve (optional)**
The drain valve can be installed to the floorpan in the left front area of the sample chamber.

1. **Fig. 11:** Place the seal [13] on base [11]. From below, hold the base [11] of the drain valve [2] against the floorpan. Screw the three retaining screws [9] through the drillings of the floorpan into the base.
2. Place the seal [13] into the receptacle at the drain valve; screw the drain valve [2] into the base [11] and tighten it.
3. Check drain valve and floorpan for leakproofness.

**WARNING – Drain valve lock!**

**To prevent contaminated liquid from being accidentally drained from the floorpan, the drain valve can be secured using a conventional padlock.**

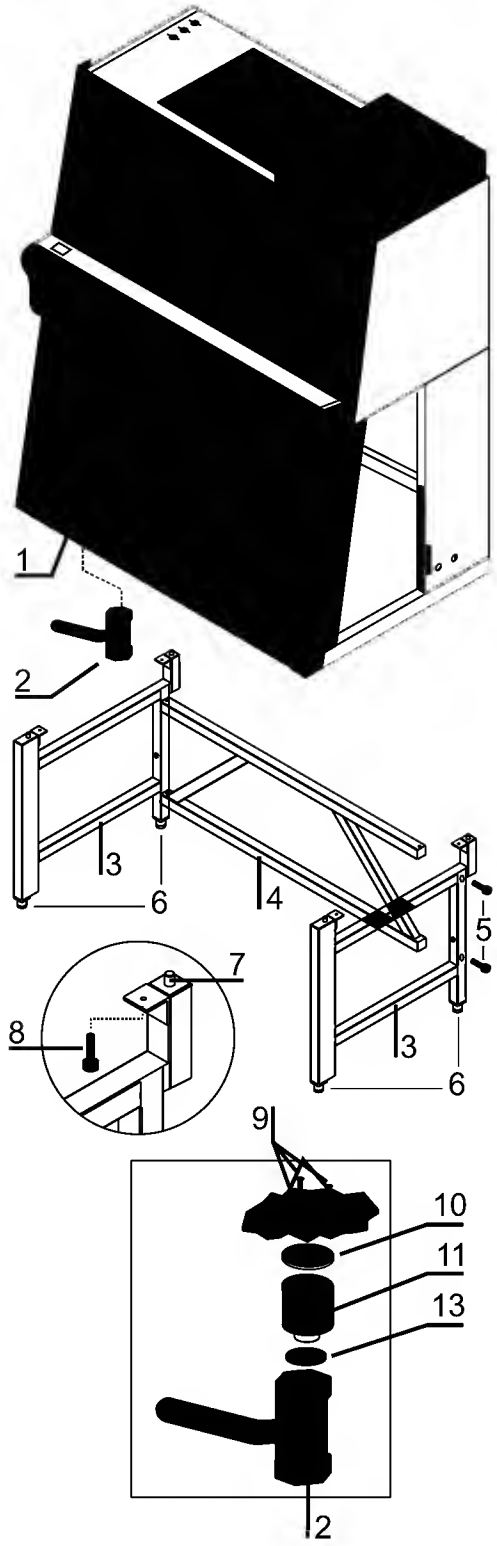



Fig. 11
Installing accessories

# 5. Start-up

## 5.3 Leveling the cabinet

The cabinet should be leveled only after it has been positioned.

1. Remove transport protection (foil) from the workplate or from the workplate segments.
2. Lift the workplate or the workplate segments by the wire hooks and place it/them onto the front and rear rails in the sample chamber with the wide line of holes facing forward.
3. Place a bubble level onto the workplate and use the four levelers to obtain a level state in all planes.

## 5.4 Activating the remote control

The remote control operates on two batteries with the following specifications:

- 1.5 V alkaline cell (AAA, Type LR 03)

**Installing the batteries:**

1. **Fig. 12:** Open the lid [4] of the battery housing at the bottom of the remote control by inserting a pointed instrument into the notch [1] and prying the lid off.
2. Insert the batteries [3]. The positive and negative poles are marked at the bottom of the battery housing.
3. Check the position of the coding switch [2]. If the switch is not set to position 1, rotate it to that position.
4. Insert the two hinges of the lid into the joints at the battery housing and slightly press onto the lid so that the retaining clip engages.

**Functional check:**

After the safety cabinet has been connected to the power supply system, check the function of the remote control by turning on the loght. Point the remote control toward the display at the sample chamber backpanel:

Press key

**Contamination protection:**

While the sample chamber is used, protect the remote control against dirt and contamination by using the disposable transparent cover.

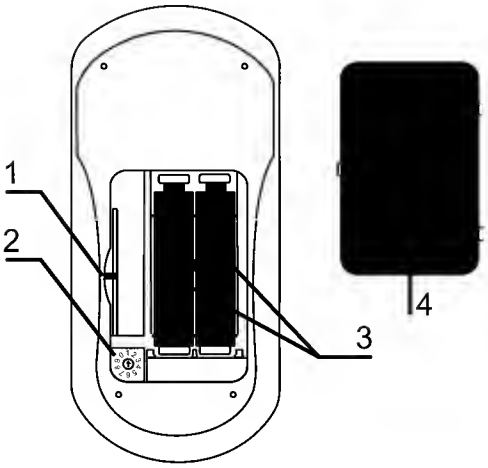



Fig. 12
Inserting the batteries

# 5. Start-up

## 5.5 Power supply connection

**WARNING – High voltage!**

**Contact with current-carrying components may cause a lethal electric shock.**
**Before connecting the device to the power supply system, check plug and power supply cable for possible damage.**
**Do not use damaged components to connect the device to the power supply system!**

**Establishing the power supply connection:**

1. Before connecting the device to the power supply system, check to see if the voltage of the outlet corresponds with the specifications on the nameplate of the device. If the ratings given for voltage (V) and maximum current (A) are not correct, the device must not be connected to the power supply system.
2. Connect the grounding plug of the device to a properly grounded and fused outlet.
   - The outlet must be fused separately using a fusible link T 15 A or using a circuit breaker B 15.
3. Make sure that the power supply line is not subjected to tensile or compressive force.

**Installation of the power supply connection:**
The mains power supply outlets should be out of reach to prevent accidental shutting off. Ideally, the outlets should be installed above the safety cabinet.
**Connecting the equipotential bonding:**
If the sample chamber is supplied with media (gas, water, etc.), the on-site equipotential bonding must be connected to one of the premounted threaded bushings either at the top of the housing or at the stand.
**Initialization routine:**
After the unit has been connected to the power supply system, the device control runs through a start-up initialization routine and switches the functions to the OFF mode. The safety cabinet is now operational and can be operated using the remote control or the pilot switch.
**Setting the clock:**
After the initialization routine has been run, the clock should be set to the appropriate time zone (see Section 6, Operation).

**NOTE – Power supply connection!**

**The safety cabinet should remain connected to the power supply system at all times to ensure that settings for the individual unit configuration remain active in the memory. If the power supply is interrupted for more than 5 minutes, the time must be reset correctly.**
**After the power supply connection has been reestablished, the system switches to the operating mode that had been active last.**

# 5. Start-up

## 5.6 RS 232 interface connection

The RS 232 interface has been designed for a cable connection with 9-pin connectors and a contact assignment of 1:1.

**Connection of the device:**

1. Turn PC off.
2. **Fig. 13:** Connect the connector of the serial interface cable (not comprised in the scope of delivery) to the socket [1] at the supply interface at the front of the electrical box.
3. Connect the serial interface cable to an unassigned slot COM 1/COM 2 etc. at the PC.
4. Turn PC on.

**Transfer protocol:**

The interface must be configured as follows:

| | |
|---|---|
| Baud: | 9600 |
| Data bits: | 8 |
| Parity: | none |
| Stop bit: | 1 |
| Protocol: | none |
| FIFO–puffer(extended modulation): | enabled |

**Occupancy of conductors:**

Type of connector [X] : 9-Pin SUB-D
Pin 2: TxD
Pin 3: RxD

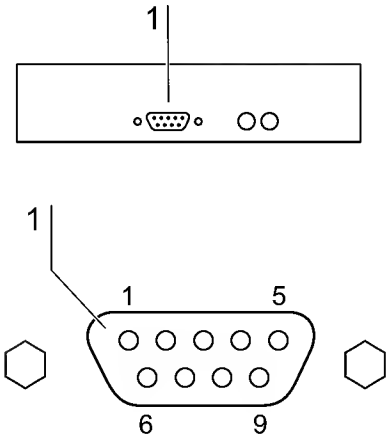



Fig. 13
RS 232 interface connection

## 5.7 UV connection

**Fig. 16:** UV disinfection adapter (optional) for an external UV disinfection unit.
Voltage: 120 V
Current: max. 1,1 A
Connectors: L, N, PE

**NOTE – Preparation of device**

**The UV disinfection device is a specially prepared option provided by Kendro Laboratory Products.**

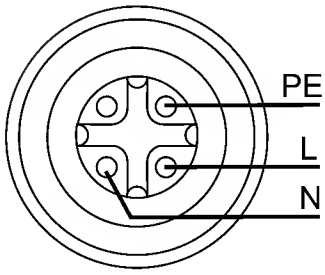



Fig. 14
UV connection

# 5. Start-up

## 5.8 Installation test

Do not operate the device before the installation test has been completed.

- The installation test must be performed in accordance with the specifications of NFS 49, Annex F. The cabinet may be operated as a Class II safety cabinet, Type A/Typ B3 if the device functions or function patterns listed below were checked and if the test results are within the safety value tolerances specified in Annex F:
  - Electrical safety test
  - Inflow velocity test
  - Downflow velocity test
  - Airflow pattern test
  - Airflow retention test
  - Airflow control test
  - Leakage test using test aerosol

- A repeat test must also be performed after repairs to the device or after considerable changes to the location of the device.

- The operator must prepare a test report or request a written test report from the authorized test service.

☞ **NOTE – Safety warranty!**

**The operational safety of the device, particularly the personal and material protection, are guaranteed only if all safety functions of the device have been tested and approved. Kendro Laboratory Products will not warrant the operational safety if the device is operated without performance of the required installation test or if the installation test and repeat test are not performed by adequately trained and authorized personnel!**

☞ **NOTE – Device hygiene!**

**The initial start-up with subsequent installation test does not include any decontamination measures. For operation in the work process, the sample chamber of the device and the accessories required for the work process must be disinfected and cleaned in accordance with the hygiene guidelines set forth for the application.**

# 6. Handling and control

## 6.1 Display

**Fig. 17:** The display at the sample chamber backpanel shows
- status messages,
- parameter input and putput.

### 6.1.1 Functions of the display components

[1] Display segment for numbers and text

**Value displays**

The LEDs 2-5 illuminate when the corresponding value is called up:
[2] Display time (yellow LED), usually the active standard display
[3] Display downflow velocity (yellow LED)
[4] Operating hours after last filter replacement (yellow LED)
[5] Display Kendro Performance Factor (yellow LED)

Function displays

The LEDs 6-9 illuminate only when the pertaining value is called up:
[6] Ventilation reduced (yellow LED)
[7] Potential-free contact activated (yellow LED)
[8] Internal power supply activated (yellow LED)
[9] UV disinfection routine activated (yellow LED)

Status displays

The LEDs 10/13 and 11/12 show the operating condition of the device as either/or conditions:
[10] Front window **is not** in working position (red LED)
[13] Front window **is** in working position (green LED)
[12] Airflow **is** steady (green LED)
[11] Airflow **is not** steady (red LED)

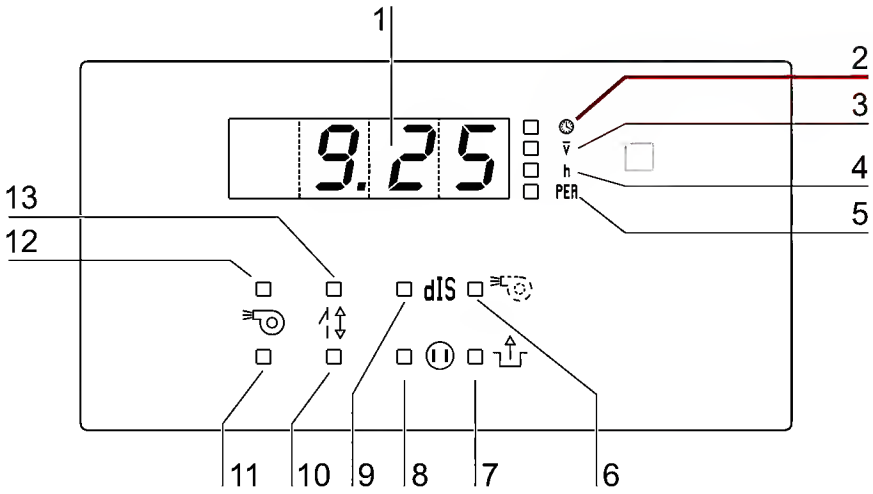



Fig. 15
Functions of the display components

# 6. Handling and control

### 6.1.2 Display in OFF mode

In the OFF mode, the display shows the current time.
For the initial start-up of the device, the clock must be set to the correct time zone and to the corresponding time output (CET mode or AM/PM mode) (see Section 6.3.9).

### 6.1.3 Display in work mode

In the work mode, the display shows the values of the device data that had been shown last (see Section 6.3.9.ff):

- Time (hours and minutes)
- Downflow velocity
- Operating hours after last filter replacement
- Kendro Performance Factor

### 6.1.4 Display and function after a power failure

After the power supply has been reestablished after a power failure, the display shows the values and functions that were last shown prior to the failure.
The functions that had been selected last will be continued where they had been interrupted.

### 6.1.5 Failure messages

Failure messages are shown on the display as text/number combinations with the codes ER 1 to ER 6. If one of these codes appears on the display, contact Technical Service immediately.

| Error code | Fault cause |
|---|---|
| ER 1 | Pressure sensor 1 / supply |
| ER 2 | Pressure sensor 2 / exhaust |
| ER 4 | BUS error |
| ER 5 | RAM error |
| ER 6 | Remote control faulty |

# 6. Handling and control

## 6.2 Description of the operating modes

The following operating modes exist for the device:
- **OFF mode**
- **Work mode**
- **Standby mode**
- **UV mode**

**OFF mode:** The device is at "idle". Utilized for charging the sample chamber or for cleaning and disinfection, the front cover can be opened when the front window is completely closed.
- The air system blowers are switched off.
- The sample chamber illumination is available.
- The internal power supply within the sample chamber is available:
  - If the internal power supply is activated, the yellow status indicator **INTERNAL POWER SUPPLY ACTIVATED** is illuminated.
- The display shows the time. If the timer has been activated, the display alternately shows the current time and the preset switching time for the timer.
- The contact for the external device connection is **not** available.

**Work mode:** Ensures personal and material protection. In this operating mode, the work process is run within the sample chamber. The device is in the work mode when the front window has been moved into the working position and the airflow is steady.
- The front window is in the working position:
  - The green status indicator **FRONT WINDOW IS IN WORKING POSITION** is illuminated.
  - No audible alarm signal.
- The air system blowers are switched on to ensure steady airflow:
  - The green status indicator **AIRFLOW STEADY** is illuminated.
- The sample chamber illumination is available.
- The power supply for the sample chamber outlets is available:
  - If the internal power supply is ON, the yellow status indicator **INTERNAL POWER SUPPLY ACTIVATED** is illuminated.
- The monitor contact for the external device connection is available:
  - If the contact is activated, the yellow status indicator **POTENTIAL-FREE CONTACT ACTIVATED** is illuminated.

**Standby mode:** For an interruption of the work process, the front window can be lowered and the sample chamber sealed aerosol-tight. The air system output has been reduced to match the lower air requirement.
- The front window is closed:
  - The air system operates at reduced output.
  - The red status indicator **FRONT WINDOW IS NOT IN WORKING POSITON** is illuminated.
  - The yellow status indicator **AIRFLOW REDUCED** is illuminated.
- The sample chamber illumination is available.
- The internal power supply in the sample chamber is available:
  - If the internal power supply is ON, the yellow status indicator **INTERNAL POWER SUPPLY ACTIVATED** is illuminated.

# 6. Handling and control

**UV mode:** For running the UV disinfection routine, the front window is completely lowered to protect against UV radiation. The routine cannot be run until the front window is in the "closed" position.

- The UV disinfection routine is activated:
  - The yellow status indicator **UV DISINFECTION ROUTINE ACTIVATED** is illuminated until the preset time for the routine has elapsed. Then, the UV lamps are switched off automatically, and the status indicator is switched off.

  The sample chamber illumination is available.
- The internal power supply in the sample chamber is **not** available:
  - If the internal power supply is activated, the yellow status indicator **INTERNAL POWER SUPPLY ACTIVATED** is illuminated.
- The integral UV lamp (optional) is available.
- The power supply for the UV disinfection adapter (optional) is available.

# 6. Handling and control

## 6.3 Remote control

The device control software monitors the selected operating mode of the safety cabinet and automatically deactivates operating functions that are not in accordance with the safety requirements of the mode.
The remote control has priority over the pilot switch.

### 6.3.1 Basic functions

**Fig. 18:** The simple operation of the remote control allows the user to control all basic functions using a minimum of operating steps to switch the safety cabinet into work mode.

**▶ Switching the device into work mode:**

Keep the SEt key depressed until the ready signal sounds

**▶ Moving the front window up:**

Press the ▲ key for approx. 1 second

When the front window reaches the working position, the movement stops automatically. When the movement starts above the working position, the front window stops at the maximal opening position.

**▶ Stopping the upward movement:**

Press, then release the ▲ key

This function can be selected with any key except the key.

**▶ Lowering the front window:**

Keep the ▼ key depressed

**▶ Stopping the downward movement:**

Release the ▼ key

**▶ Silencing the audible alarm signal:**

Press the key

**▶ Switching the device to OFF mode:**

Keep the SEt key depressed until the ready signal sounds

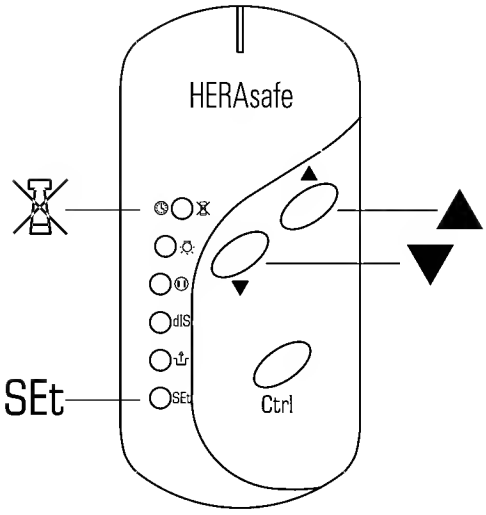



Fig. 16
Basic functions of the remote control

# 6. Handling and control

Availability of functions in the different operating modes: x = available

| Key | Mode | | | |
|---|---|---|---|---|
| | OFF mode | Work mode | Standby mode | UV mode |
| SEt | X | X | X | X |
| ▲ | | X | X | |
| ▼ | | X | X | |
| / | X | X | X | |
| | X | X | X | X |
| dIS | | X | X | X |
| | X | X | X | X |
| Ctrl. | X | X | | |
| | | X | | |

### 6.3.2 Moving the front window to the working position

1. Raising or lowering the dront window:

   Keep the ▲ key depressed for approx 1 second

   The red status indicator on the display is illuminated

   The audible alarm signal is on.

2. When the front window reaches the working position, the movement is automatically stopped.

   The green status indicator on the display is illuminated

   The audible alarm signal is off if the airflow is steady.

3. If the movement starts above the working position, the front window must first be lowered below the working position and then be raised again. To lower the front window:

   Keep the ▼ key depressed

4. To stop the downward movement:

   Release the ▼ key

# 6. Handling and control

### 6.3.3 Silencing the audible alarm signal

When the front window is moved out of the working position or when the pressure sensors detect a safety-relevant change of the airflow velocities, the corresponding visual and audible alarm signals are issued. To silence the audible alarm:

- Press, then release the key

The visual alarm signals cannot be switched off. They will only change their status when relevant functions are in a "safe" mode again.
When operating the pilot switch, the audible alarm signal that sounds during a front window movement can be silenced as follows:

1. Release the ▲ or the ▼ key.
2. Press, then release the ▲ or the ▼ key.
3. Continue operation with either key; the audible alarm signal will remain off.

### 6.3.4 Switching the illumination on and off

In each operating mode, the sample chamber illumination can be switched on or off.

1. To switch the illumination on or off:

   Press, then release the key

### 6.3.5 Activating and deactivating the internal power supply

All outlets in the sample chamber can be activated (power supply on) or deactivated (power supply off) simultaneously.

1. To activate the power supply:

   Press, then release the key

   The yellow status indicator □ is illuminated.

2. To deactivate the power supply:

   Press, then release the key

   The yellow status indicator □ goes off.

# 6. Handling and control

### 6.3.6 Displaying the UV disinfection time

This value refers to the operating hours of the set run time of the UV disinfection or of the power supply for the UV disinfection adapter (optional). This display function is only available when the front window is not closed. The device must be switched to work mode.

1. To display the value:

   - Press, then release the dIS key

   The time value is output in segments of 30 minutes.

2. To deactivate the value display:

   The value display is deactivated automatically after 2-3 seconds.

### 6.3.7 Activating and deactivating the potential-free contact (optional)

Generally, an external alarm signal that is connected to the safety cabinet control can only be activated when the device is in the secured work mode.

1. To activate the contact:

   Press, then release the key

   The yellow status display L is illuminated.

2. To deactivate the contact:

   Press, then release the key

   The yellow status display L goes off.

**NOTE – LED for external alarm system!**

**If this button is pressed on the remote control, the LED also illuminates if no external alarm system is connected to the device.**

### 6.3.8 Switching the cabinet to OFF mode

The unit can be switched to OFF mode from any other operating mode:

- Keep the SEt key depressed until the ready signal sounds

# 6. Handling and control

### 6.3.9 Setting the time

The current time of the time zone in which the unit operates must be set at the start-up of the safety cabinet. Two different display modes can be selected:

- CET mode (24:00 hours)
- AM/PM mode (12:00 hours)

When the time is to be set, the device must be in the OFF mode.

1. Set the time:

   Keep the Ctrl. key depressed until the two-digit hour disply flashes.

   The minute display shows either A, P or no value (CET time display). The time zone is set at the same time as the hour value: First, set the time zone (sequence: CET, A, P), then set the exact hour value.

2. While increasing or decreasing the hour value in increments, set the time zone:

   Press, then release the ▲ or the ▼ key

3. Scroll through values:

   Keep the ▲ or the ▼ key depressed

   If the keys are depressed for approx. 2 or 3 seconds, a higher scroll speed is selected.

4. Store the hour and time zone setting:

   Press the Ctrl. key

   The function switches to minute display (flashing).

5. Set the minutes:

   Press, then release the ▲ or the ▼ key

6. Scroll through values:

   Keep the ▲ or the ▼ key depressed

   If the keys are depressed for approx. 2 or 3 seconds, a higher scroll speed is selected.

7. Store the minute value:

   Press, then release the Ctrl. key

   The display shows the time.

# 6. Handling and control

**NOTE – Calling up device data!**

**The following data can be called up in succession:**

- **Time (hours/minutes)**
- **Downflow velocity (ft/min)**
- **Operating hours after last filter replacement**
- **Kendro Performance Faktor**

**To call up values in succession:**

- **Press, then release the Ctrl. key for each value**

**The following three sections contain detailed information about displaying values.**

### 6.3.10 Displaying the downflow velocity

The sensor system of the device continuously monitors the downflow velocity of the airstream in the sample chamber. The currently determined value (feet/min) can only be called up in the work mode.

- To display the velocity value:

  Press the Ctrl. key repeatedly until the yellow □ $\overline{v}$ LED illuminates.

### 6.3.11 Displaying the total operating hours

Use this function to display the total operating hours of the device since the last filter replacement. After each filter replacement, the value for the operating hours is reset to zero.

1. To display the total operating hours value:

   Press the Ctrl. key repeatedly, until the yellow status indicator □ h on the display is illuminated.

2. The displayed value, multiplied by factor 10, shows the total operating hours of the device.

# 6. Handling and control

### 6.3.12 Displaying the Kendro Performance Factor

The Kendro Performance Factor (PER) is a value that indicates the safety state of the safety cabinet.
This value is calculated from data determined by the cabinet safety system and from values captured empirically by service personnel during safety checks. This data is entered into a parameter list of the control software and interconnected. The result can be indicated by the display.

1. To call up the PER:

   Press the Ctrl key repeatedly until the yellow status indicator ☐ PER on the display is illuminated.

   The PER is displayed as an integer.

2. To evaluate the PER:

   **Number in the 100 to 60 range:** The safety cabinet is operationally safe. Personal and material protection is ensured.

   **Number in the 59 to 30 range:** The safety cabinet is still operationally safe. Personal and material protection is ensured.The safety system should be checked.

   **Number in the 29 to 0 range:** The safety of the device may be impaired. The failure causes must only be repaired by authorized service personnel. Contact Technical Service.

☞ **NOTE – Calling up value!**

**The value should only be called up, when the airflows have stabilized itself after a lead time of approx. 20 min.**

# 6. Handling and control

### 6.3.13 Setting and activating the timer

The timer function allows you to switch the safety cabinet from the OFF mode to the work mode at a predetermined time. The timer can only be set when the device is in the OFF mode.

1. To set the switching time:

   Keep the ⏲ key depressed until the ready signal sounds

   The display flashes the two-digit hour display.

2. Increase or decrease the hour value in increments:

   Press, then release the ▲ or the ▼ key

3. Scroll through the value display:

   Keep the ▲ or the ▼ depressed

   If the keys are depressed for approx. 2 or 3 seconds, the higher scroll speed is selected.

4. Store the hour setting:

   Press, then release the Ctrl. key

   The function switches to minute display (flashing).

5. Set the minute value:

   Press, then release the ▲ or the ▼ key

6. Scroll through the value display:

   Keep the ▲ or the ▼ depressed

   If the keys are depressed for approx. 2 or 3 seconds, the higher scroll speed is selected.

7. Store the minute value and activate the timer:

   Press, then release the Ctrl. key

   The status display □ 🕒 flashes. After a moment, the display shows the current time again. When the value is stored, the timer is automatically activated.

If the setting is not stored, the switching time will be reset to the original value after approx. 15 seconds.

# 6. Handling and control

**NOTE – Activating the timer!**

**If the timer is to be activated without a prior change of the time values, the procedure above is performed and the existing time values are confirmed:**

**Press, then release the Ctrl. key for each value.**

**After the minute value has been confirmed, the timer has been activated.**

**NOTE – Timer function!**

**The timer can not be used as a start routine that calls up its function automatically.**
**It must be reactivated separately for each deferred device start.**

### 6.3.14 Deactivating the timer

If the device was started at a preset time, the timer function is also deactivated automatically. The deferred start can therefore be cancelled only while the device is still in the OFF mode.

- To deactivate the timer function for starting the device:

  Keep the SEt key depressed until the ready signal sounds

  The safety cabinet changes to the work mode.

  The status indicator ☐ 🕓 illuminates continuously, and the display shows the current time.

# 6. Handling and control

### 6.3.15 Setting the UV disinfection time

Depending on the equipment option of the cabinet, this setting is used to:

- determine the disinfection time of the optional UV lamps in the side walls or
- set the time for the power supply of a mobile UV device at the UV adapter.

Factory setting is one hour. The time can be set within a range between 0 and 24 hours in increments of 30 minutes each. The unit must be in the work mode (the front window must not be closed). For each following start of the UV disinfection, the routine is run with this preset time value.

1. Select the function:

   Keep the dIS key depressed until the ready signal sounds

   The display flashes the run time that had been selected last.

2. Set or change the disinfection time. To increase the value in increments:

   Press, then release the ▲ or the ▼ key

3. Scroll through the value display in increments of 30 minutes:

   Keep the ▲ or the ▼ key depressed

4. Store the setting:

   Press, then release the Ctrl. key

If the setting is not stored, the disinfection time will be reset to the original value after approx 15 seconds.

### 6.3.16 Starting the UV disinfection

The UV disinfection can only be started if the front window is completely lowered (standby mode). Depending on the equipment of the unit version, this function is used to:

- switch on the optional UV lamps in the side walls or
- activate the power supply for the outlets of the mobile UV device.

- Start the routine:

  Keep the dIS key depressed until the ready signal sounds

  The display alternately shows the text *DIS* and the remaining disinfection time in hours and minutes.

  The yellow status indicator □ dIS is illuminated.

  After the disinfection time has elapsed, the current time is displayed.

### 6.3.17 Cancelling the UV disinfection

While the UV disinfection routine is run, it can be interrupted at any time.

1. Cancelling the routine:

   - Press, then release the dIS key

     The status indicator □ dIS goes off.

2. The display shows the current time.

### 6.3.18 Activating the stop watch

The stop watch function starts a countdown for a preset time (max. 99 min and 59 s) and issues an audible signal when the set time has elapsed. The signal cannot sound if some other device function has already caused an alarm. The function can only be avtivated if the device is in the work mode.

1. Select the stop watch function:

   - Keep the key depressed until the ready signal sounds

2. Set the minutes (0 - 99) in increments:

   Press, then release the ▲ or the ▼ key

3. Scroll through the value display:

   Keep the ▲ or the ▼ depressed

   If the keys are depressed for approx. 2 or 3 seconds, the higher scroll speed is selected.

4. Store the minute setting:

   Press, then release the Ctrl. key

   The function switches to second display (flashing).

5. Set the second value (0 - 59):

   Press, then release the ▲ or the ▼ key

6. Scroll through the value display:

   Keep the ▲ or the ▼ depressed

   If the keys are depressed for approx. 2 or 3 seconds, the higher scroll speed is selected.

7. Store the setting and start the stop watch:

   Press, then release the Ctrl. key

# 6. Handling and control

8. Indication of the function:

   The predefined time value counts to zero.

## 6.4 Pilot switch

**Fig. 19:** If the remote control is not available, the basic functions required for the operation of the device can be controlled with the pilot switch:
- Raising and lowering the front window,
- silencing the audible alarm signal,
- switching the device to OFF mode.

### 6.4.1 Moving the front window:

The movement of the front window is controlled by depressing the pilot switch control element with the corresponding arrow symbol.

1. To raise the window, press the control element [1]. When the front window reaches the working position, the movement stops automatically. If the movement starts above the working position, the front window stops at the maximal opening position.
2. To stop the upward movement, release the control element.
3. To lower the window, keep the control element [2] depressed.
4. To stop the downward movement, release the control element.

**NOTE – Switching functions (on/off)**

**If the device is started with the pilot switch, the chamber illumination is switched on.**
**If the device is switched off with the pilot switch, the chamber illumination is also switched off.**

5. If the front window is not in the working position,
   - the red status indicator **FRONT WINDOW IS NOT IN WORKING POSITION** is illuminated.
   - the audible alarm signal can be silenced (i.e. switched off).
6. When the front window reaches its working position, the movement stops automatically:
   - The green status indicator **FRONT WINDOW IS IN WORKING POSITION** is illuminated.
   - The audible alarm signal is switched off.

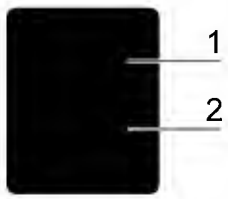



Fig. 17
Basic functions of the pilot switch

# 6. Handling and control

### 6.4.2 Silencing the audible alarm signal:

1. Release the control element.
2. Press, then release the control element.
3. Continue window movement by depressing one of the control elements. The audible alarm signal remains off.

### 6.4.3 Switching the device to OFF mode

1. Move the front window to the upper and lower end positions.
2. Release the control element.
3. Keep the previously actuated control element depressed until the ready signal sounds.

**NOTE – Switch-off function**

**If the device is switched to the OFF mode with the pilot switch, the chamber illumination is switched off. The device-internal power supply remains in the last functional state that it had been switched to.**

# 7. Operation

## 7.1 Hygiene preparations for the sample chamber

The sample chamber surfaces and the accessories required for the work process must be disinfected and cleaned in accordance with the hygiene guidelines set forth for the application.

## 7.2 Preparing the sample chamber

Installing the accessories:
1. Lower the front window completely.
2. Open the front cover or move the front window into the maximum opening position.
3. Position the accessories in the working area of the workplate.
4. Close the front cover.
5. Move the front window to its working position and wait until the airflow has stabilized.

**CAUTION – Operational safety!**

**The personal and material protection is ensured only if the airflow system of the device is working properly.**
**If the alarm system issues failure messages when the front window is in the working position, stop all applications that may release harmful aerosols!**

6. Then place samples into the chamber.
7. To interrupt the work process or for extensive experiment cycles without manual interference, switch the device to standby mode. When the working opening is completely closed, the safety cabinet is sealed aerosol-tight.

## 7.3 Response to failure messages

Failure messages are displayed in form of text/number combinations with a code between ER 1 and ER 6. If one of these codes is displayed, contact the Technical Service immediately.
To isolate the cause of the failure, the operating personnel must perform only the following tests and measures:
- Check to see if the exhaust air opening on top of the cabinet is blocked.
- Ensure that the on-site exhaust air system is activated.
- Close doors and windows in the laboratory to prevent drafts.
- Switch off devices in the vicinity of the safety cabinet that cause air turbulence or emit excessive heat.
- Open flames in the sample chamber may impair airflow conditions.

# 7. Operation

## 7.4 Work rules

The observance of work rules ensures a minimum of operational safety when handling the safety cabinet.

**Before starting an operation:**
- Take off jewelry.
- Put on required personal protective gear, e.g. hand, face, or body protection.
- Clean and disinfect sample chamber surfaces at regular intervals.

**During an operation:**
- Place samples only with in the defined work area of the workplate.
- Do not place unnecessery items into the sample chamber.
- Use only disinfected and cleaned accessories for the work process.
- Do not cause air turbulence, by quick hand, arm or body movement in the sample chamber or in front of the work opening.
- Do not place accessories into the sample chamber that cause air turbulence or emit excessive heat.
- Do not block air circulation at the ventilation slots of the workplate.

**After finishing an operation:**
- Remove samples from the sample chamber and store them properly.
- Clean and disinfect the sample chamber surfaces, including the workplate and the floorpan. Clean and disinfect all accessories.

# 8. Shut-down

## 8.1 Interrupting an operation

To interrupt a work process, the device is switched to the OFF mode.
1. Remove all samples from the safety cabinet and store them properly.
2. Remove accessories from the sample chamber and clean and disinfect them.
3. Clean and disinfect the sample chamber surfaces, the workplate, and the floorpan.

## 8.2 Shutting the unit down

If the unit is not to be used or stored for an extended period of time, it must be completely decontaminated.

**CAUTION – Decontamination measures!**

**To shut the device down, the sample chamber must be disinfected completely and the plenum, including the filters, must be sterilized using formaldehyde.**

1. After the device has been decontaminated, close the front window completely.
2. Disconnect the device from the power supply system.

**NOTE – Removing the batteries!**

**To prevent the batteries from leaking and to prevent their contacts from oxidizing during extensive operation intermissions, remove the batteries from the remote control and store them in a dry place.**

# 9. Cleaning and decontamination

## 9.1 Decontamination procedure

Several procedures can be applied for decontaminating the safety cabinet. Which procedure is selected, depends on:
- the potential risk imminent in the agents,
- the degree of purity required by an experiment or by a work process.

**Possible decontamination procedures:**
**Wipe/spray disinfection:** is the standard disinfection procedure for cabinets used for microbiological experiments.

**UV disinfection:** is particularly suited as an intensifying additional disinfection after a wipe/spray disinfection.

**Sterilization with steam:** can be used for treating the removable stainless steel components. Examples of autoclavable components are the bezels of the UV lamps, the workplate or workplate segments and the armrests.

**Disinfection with formaldehyde:** can be performed if a sterile scmple chamber is required for the work process. This sterilization procedure is mandatory:
- when filters are replaced,
- when the device is shut down,
- when the device is discarded.

## 9.2 Wipe/spray disinfection

The wipe/spray disinfection is performed in three stages:
- Predisinfection
- cleaning
- final disinfection

Recommended disinfectants:

**NOTE – Compatibility!**

**Chloride-containing disinfectants may damage some surfaces; use only chloride-free disinfectants or a disinfectant with a low enough chloride content to have been proved harmless for stainless steel finishes!**
**Disinfectants with an alcohol content of more than 70 % may cause embrittlement of plastic components after extended esposure. Use only disinfectants with a low alcohol content. When using a disinfectant with an alcohol content of more than 70 %, the release limit of 200 g within 2 hours must not be exceeded.**
**Also suited are disinfectants based on quaternary ammonium compounds.**

# 9. Cleaning and decontamination

**Predisinfection:**

1. Remove all samples from the sample chamber and store them properly.
2. Remove accessories from the safety cabinet and disinfect them using the disinfection procedure recommended by the manufacturer.
3. The workplate and stainless steel components can be removed from the sample chamber and disinfected separately.
4. For predisinfection, spray disinfectant on all sample chamber surfaces or wipe the surfaces using disinfectant.
5. Do not remove the optional UV lamps from the sockets; wipe them thoroughly using a damp cloth.
6. Switch the device to work mode, move front window to the working position.
7. Allow disinfectant to react as recommended by manufacturer, then operate the safety cabinet for at least 15 to 20 minutes in the work mode so that released aerosols can be absorbed by the filters.

**Cleaning:**

1. Wipe the surfaces clean using a clean cloth and plenty of clear water.
2. Remove dirt residues and deposits thoroughly.
3. Remove the cleaning liquid from the floorpan and wipe all sample chamber surfaces dry.

**Final disinfection:**

1. Again, spray disinfectant on all sample chamber surfaces or wipe the surfaces clean with disinfectant.
2. Allow disinfectant to react as recommended by manufacturer.

# 9. Cleaning and decontamination

## 9.3 UV disinfection after a wipe/spray disinfection

A UV disinfection can be performed either by using the optional integral UV lamps or by using a mobile UV device. The run time of the routine can be preset with the remote control (see Section 6.3.16).

### 9.3.1 UV disinfection using the integral UV lamps

1. Remove the stainless steel covers from the lamp mountings in the side walls.
2. Lower the front window completely.
3. Start the UV disinfection using the remote control.

### 9.3.2 UV disinfection using a mobile UV device

To control the disinfection routine of a mobile UV device with the safety cabinet software, ensure that the connecting plug of the UV device is compatible with the UV disinfection adapter of the safety cabinet.

1. Position the mobile UV device centered on the work area and connect to the UV disinfection adapter.
2. Lower the front window completely.
3. Start the UV disinfection using the remote control.

## 9.4 Disinfection with formaldehyde

**Procedure:**
For gas disinfection, formaldehyde is evaporated in the tightly sealed sample chamber. The quantity of the formaldehyde used depends on the sample chamber volume of the cabinet version to be disinfected (see Technical Data).
Per cubic meter of sample chamber volume, at least 5 g formaldehyde must be evaporated with 20 ml water (corresponds with 25 ml of a 20 % formaldehyde solution). The formaldehyde evaporates immediately when its boiling point is reached. The required reaction time is at least 6 hours.
After the required reaction time, the formaldehyde should be neutralized by evaporating a 25 % ammonium solution (10 ml per cubic meter of sample chamber volume).
**Ambient conditions and accessories:**
The temperature at the cabinet location should be approx. 21° C, the relative humidity should be between 60 and 85 %. To evaporate the solution, a heating device with a container is required.

**NOTE – Disinfection procedure!**

**A disinfection with formaldehyde must be performed in accordance with the specifications of NSF 49/1992, Annex G.**
**As this procedure has considerable risks, it must only be performed by specially trained and authorized service personnel!**

# 9. Cleaning and decontamination

## 9.5 Cleaning the exterior surfaces

Wipe the exterior surfaces of the device clean using a solution of tepid water and commercial dishwasher solution. Then, wipe exterior surfaces dry using a soft, clean cloth.

## 9.6 Cleaning the floorpan

Clean the floorpan using a solution of tepid water and commercial dishwasher.

1. Remove the working plates from the sample chamber.
2. Remove dirt residues and deposits thoroughly.
3. Wipe the floorpan clean using a clean cloth and plenty of clear water.
4. Remove the cleaning liquid from the floorpan and wipe the floorpan surfaces thoroughly clean.

**NOTE – Material residues**

**After cleaning, make sure that all cleaning materials have been removed completely from the floorpan.**

5. Reinstall the working plates.

# 10. Maintenance

## 10.1 Inspection

PER is the value that indicates the safety state of the safety cabinet by monitoring various device parameters.
- If PER shows a value below 60, the device should be inspected.
- Independent of the PER value, the safety cabinet must be inspected on an annual basis.

The annual inspection comprises the following checks:
- Electrical safety in accordance with national regulations.
- Functional test of the device.
- Checking all components for possible damage.
- Checking the filter state.

**NOTE – Perforated plate!**

**The Perforated plate at the blanket of the sample chamber serves for the protection of the downflow filter and prevents refluxing. While scanning the filter surface for leak test the perforated plate must be built-in.**

- Checking the airflow conditions.
- Repeat test in accordance with NSF 49/1992, Annex F.

## 10.2 Service

**ULPA filters:**
As the filter replacement is an interference with the safety system of the device, filters must only be replaced by Kendro Laboratory Products or by adequately trained and authorized service personnel.

**NOTE – Repeat test!**

**After the filter replacement, a repeat test must be performed in accordance with NSF 49/1992, Annex F.**

### 10.2.1 UV lamps:

The UV lamps should be replaced after 1500 operating hours:
1. Remove cover from lamp housing.
2. Rotate the lamp in the socket so that the lamp contacts can be removed from the groove in the socket.
3. Insert the new lamp into the socket and rotate until the contacts engage.
4. Replace cover.

# 10. Maintenance

### 10.2.2 Sample chamber illumination:

The tubes are installed in the front cover bezel.

1. Remove the bezel retaining screws and the bezel.
2. The luminescent tubes are retained by rotatable sockets. Rotate the tube carefully to the removal position and remove it from the socket.
3. Insert the replacement tube and rotate it to the working position.
4. Reinstall the bezel and secure it with the screws.

### 10.2.3 Replacing the front cover seal:

**Fig. 20:** When the front cover seal shows visible sign of wear, the seal must be replaced.

The sealing is slipped onto the housing frame and secured by an additional retaining strip at the lower edge of the sample chamber opening.

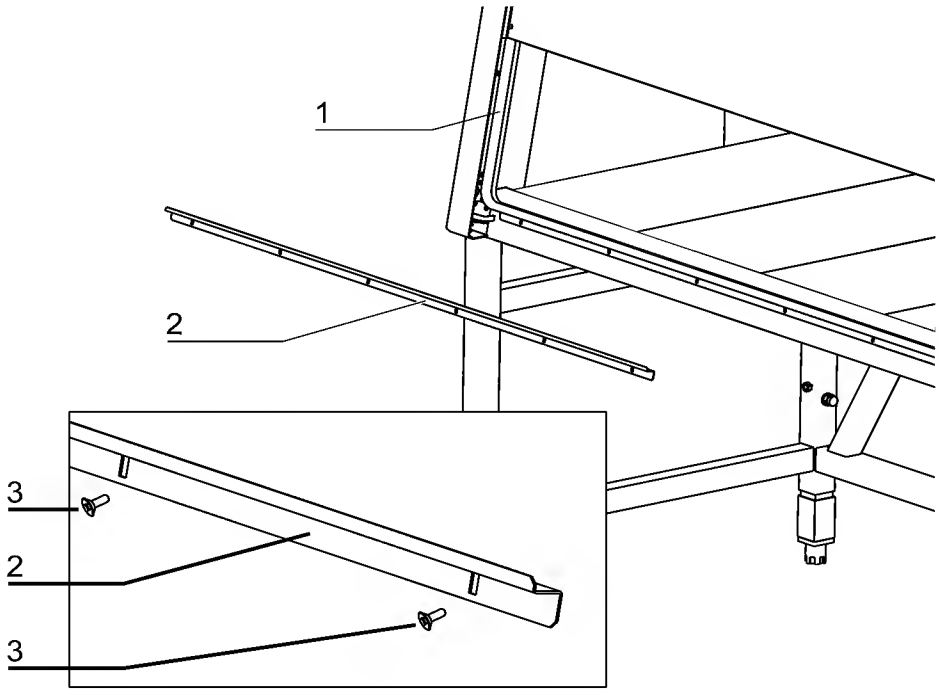



Fig. 18
Front cover seal replacement

1. Lower the front window completely and open the front cover.
2. Remove the six retaining screws [3] and remove the retaining strip [2].
3. Remove the seal [1] from the housing frame retaining lip.
4. Slip the groove of the new seal onto the housing frame retaining lip and push it on so that the seal fits evenly along the entire sealing surface.
5. Secure the retaining strip with the screws.

# 10. Maintenance

## 10.3 Retrofitting and repairs

External communication systems, e.g. failure report systems or components for supplying media such as gas solenoid valves can be retrofitted and integrated into the device control.

**NOTE – Retrofitting and repairs!**

**All retrofitting and repair work are interferences with the safety system of the unit. Particularly modifications to the filter system and resulting changes of the airflow may impair personal and material protection. Such work must be carried out only by authorized service personnel.**

# 11. Disposal

## 11.1 Disposal procedure

Discarded cabinets or unit components contain reusable materials. All components with the exception of the ULPA filters can be disposed of after having been thoroughly cleaned and disinfected. The ULPA filters must be disposed of in accordance with the applicable national and state regulations for special solid waste.

**CAUTION – Contamination hazard!**

**As the device can be used for processing and treating infectious substances, it may be contaminated.**
**Prior to disposal, the complete device with filters must be decontaminated by performing a formaldehyde sterilization!**

**Recyclable materials!**

| Component | Material |
|---|---|
| Thermal insulation components | Polystyrene foam, EPS/PPS compound |
| Printed circuit boards | Enclosed electrical components coated with various plastics, mounted on epoxy resin-bound boards. |
| Plastic components, general | Note material labeling |
| Exterior housing | Steel, painted |
| Device backpanel | Stainless steel/steel, painted |
| Front cover seal | EMPP |
| Front window, side windows | Multi-layer safety glass |
| Operating panel and indicator foil | Polyethylene |
| Workplates | Stainless steel |
| UV bezels | Stainless steel |
| Armrests | Stainless steel |
| Batteries | Alkaline cells |

# 12. Technical data

| Dimensions | | | | | |
|---|---|---|---|---|---|
| **HERAsafe** | | **KS 9** | **KS 12** | **KS 15** | **KS 18** |
| **Exterior dimensions** | | | | | |
| Width | mm / inch | 1000 / 39.4 | 1300 / 51.2 | 1600 / 63.0 | 1900 / 74.8 |
| Depth | mm / inch | 780 / 30.7 | | | |
| Height | mm / inch | 1580 / 62.2 | | | |
| | | | | | |
| **Interior dimensions** | | | | | |
| Width | mm / inch | 900 / 35.4 | 1200 / 47.2 | 1500 / 59.0 | 1800 / 70.9 |
| Depth | mm / inch | 630 / 24.7 | | | |
| Height | mm / inch | 780 / 30.7 | | | |
| | | | | | |
| **Front opening** | | | | | |
| **Front window** | | | | | |
| Working position | mm / inch | ~250 / ~10.0 | | | |
| Max. opening | mm / inch | 780 / 30.7 | | | |
| | | | | | |
| **Working area height** | | | | | |
| KFS 1, seat pos. | mm / inch | 750 / 29.53 | 750 / 29.53 | 750 / 29.53 | 750 / 29.53 |
| KSF 2, heightable | mm / inch | 750 - 950 / 29.5 - 37.4 | | | |
| | | | | | |
| **Stand height** | | | | | |
| KSF 1 | mm / inch | 680 / 27.0 | | | |
| KSF 2 | mm / inch | 680 - 880 / 27.0 - 34.5 | | | |
| | | | | | |
| **Unit height with stand** | | | | | |
| KSF 1 | mm / inch | 2260 / 88.9 | | | |
| KSF 2 | mm / inch | max. 2460 / 96.8 | | | |
| | | | | | |
| **Side wall feed throughs** | | | | | |
| Diameter | mm / inch | 23 / 0.9 | | | |
| Distance lower edge | mm / inch | 130 / 5.1 | | | |
| Distance from backpanel | | | | | |
| Bushing 1 | mm / inch | 160 / 6.3 | | | |
| Bushing 2 | mm / inch | 250 / 9.8 | | | |
| | | | | | |
| **Optional media connections in chamber backpanel** | | | | | |
| Diameter | mm / inch | R 3/8 | R 3/8 | R 3/8 | R 3/8 |
| Outer distance left | | | | | |
| Connection 1 | mm / inch | 370 / 14.6 | | | |
| Connection 2 | mm / inch | 470 / 18.5 | | | |
| Connection 3 | mm / inch | 570 / 22.4 | | | |
| Outer distance right | | | | | |
| Connection 4 | mm / inch | 570 / 22.4 | | | |
| Connection 5 | mm / inch | 470 / 18.5 | | | |
| Connection 6 | mm / inch | 370 / 14.6 | | | |

# 12. Technical data

| Volume, weights, and loads | | | | | |
|---|---|---|---|---|---|
| **HERAsafe** | | **KS 9** | **KS 12** | **KS 15** | **KS 18** |
| **Volume** | | | | | |
| Unit volume | $m^3$ | 1.1 | 1.4 | 1.7 | 2.1 |
| Floorpan | l | 30 | 40 | 50 | 60 |
| **Weights** | | | | | |
| Cabinet | kg | 190 | 240 | 290 | 340 |
| Stand KSF1 | kg | 26 | 26 | 27 | 27 |
| Stand KSF2 | kg | 30 | 30 | 31 | 31 |
| **Loads** | | | | | |
| Max. load per working area module | | | | | |
| | kg | 25 | | | |
| Max. load on overall working area | | | | | |
| | kg | 50 | 75 | 75 | 75 |

| Electrical data | | | | | |
|---|---|---|---|---|---|
| **HERAsafe** | | **KS 9** | **KS 12** | **KS 15** | **KS 18** |
| **Voltage** | | | | | |
| Rated voltage | V~ | 115 | | | |
| Rated frequency | Hz | 60 | | | |
| Blower voltage | V ⎓ | 48 | | | |
| **Current** | | | | | |
| Power consumption | A | 9.22 | 9.22 | 12.00 | 12.00 |
| Motherboard fusing | | 2 x T 16 A | | | |
| Outlet fusing | A | T 5 A | | | |
| On-site fusing | | Circuit breaker B15 / Fuse T 15 A | | | |
| **Power** | | | | | |
| Power input | kW | 1.06 | 1.06 | 1.38 | 1.38 |
| **Protection** | | | | | |
| Protection class | | I | | | |
| Protection type | | IP 20 | | | |

| Pressure | | | | | |
|---|---|---|---|---|---|
| **HERAsafe** | | **KS 9** | **KS 12** | **KS 15** | **KS 18** |
| Pressure media valves | bar | max. 6 | | | |

# 12. Technical data

| Airflow system | | | | | |
|---|---|---|---|---|---|
| **HERAsafe** | | **KS 9** | **KS 12** | **KS 15** | **KS 18** |
| **Airflows** | | | | | |
| **Airflow velocities** | | | | | |
| Inflow | m/s | 0.53 | 0.53 | 0.53 | 0.53 |
| | ft/min | 105 | 105 | 105 | 105 |
| Downflow | m/s | 0.36 | 0.39 | 0.36 | 0.36 |
| | ft/min | 70 | 75 | 70 | 70 |
| **Air volume** | | | | | |
| Overall volume flow | $m^3/h$ | 1090 | 1510 | 1890 | 2180 |
| | $ft^3/min$ | 660 | 890 | 1140 | 1320 |
| Downflow volume flow | $m^3/h$ | 680 | 930 | 1170 | 1320 |
| | $ft^3/min$ | 410 | 550 | 690 | 820 |
| Exhaust air volume flow | $m^3/h$ | 410 | 580 | 720 | 860 |
| | $ft^3/min$ | 250 | 340 | 450 | 500 |

| Filters | | | | | |
|---|---|---|---|---|---|
| **HERAsafe** | | **KS 9** | **KS 12** | **KS 15** | **KS 18** |
| Type | | ULPA (H 14 according to DIN EN 1822) | | | |
| Material | | Glas fiber fleece | | | |
| Separability in MPPS | % | 99.995 | | | |
| Separability at 0.3 µm particle size | % | 99.999 | | | |
| **Downflow** | | | | | |
| Width | mm/inch | 915 / 36.0 | 1220 / 48.0 | 1525 / 60.0 | 1830 / 70.0 |
| Depth | mm/inch | 457 / 18.0 | 457 / 18.0 | 457 / 18.0 | 915 / 36.0 |
| Height | mm/inch | 93 / 3.7 | 93 / 3.7 | 93 / 3.7 | 93 / 3.7 |
| **Exhaust air** | | | | | |
| Width | mm/inch | 457 / 18.0 | 610 / 24.0 | | 915 / 36.0 |
| Depth | mm/inch | 457 / 18.0 | 457 / 18.0 | | 457 / 18.0 |
| Height | mm/inch | 117 / 4.6 | 117 / 4.6 | | 117 / 4.6 |

# 12. Technical data

| Ambient conditions | | | | | |
|---|---|---|---|---|---|
| **HERAsafe** | | **KS 9** | **KS 12** | **KS 15** | **KS 18** |
| **Temperature** | | | | | |
| Max. ambient temperature during operation | °C | 40 | | | |
| | °F | 104 | | | |
| Min. ambient temperature during operation | °C | 10 | | | |
| | °F | 49 | | | |
| **Humidity** | | | | | |
| Max. humidity / operation | % r.H. | 90 | | | |
| Max. humidity / storage | % r.H. | 95 | | | |
| **Heat dissipation to environment** | | | | | |
| Room temperature 20° C/ 68° F | BTU/hr | 615 | 615 | 1230 | 1230 |
| **Room temperature rise** | | | | | |
| Above room temperature with window closed | °K | < 8 | < 8 | < 8 | < 8 |

# 13. Device log

| | | | |
|---|---|---|---|
| **Device type:** | | **Part number:** | |
| **Serial number:** | | **Service number:** | |
| **Location:** | | **Operator's note:** | |

| Work carried out | Notes | Date | Signature |
|---|---|---|---|
| | | | |
| | | | |
| | | | |

# 14. Certificate of decontamination

| Invoice recipient / Customer no.: | | | Location / Forwarding address: | | |
|---|---|---|---|---|---|
| Year of manufacturer: | KC: | ST: | Name of technician: | | Appointed date: |
| order date: | Ordered by: | | Order no.: | | |
| Type of device: | | | ID no. / Order no.: | Operating hours: | |
| Equipment no.: | Factory no.: | Service device no.: | Date of delivery: | Date of start-up: | Customer inventory no.: |

## Certficate of decontamination

Dear customer,

when using biological and chemical agents within and ouside of devices, hazards to the health of the operating personnel may be present and contamination of the surroundings of the device may occur when service or repair works are carried out.
Within the scope of national and international legal regulations, such as
- responsibility of a company for the protection of its employees,
- responsibility of the operator for the operational safety of devices,
all possible hazards must absolutely be prevented. Prior to any calibration, service, and repair works, prior to any relocation of a device, and prior to the shut-down of a device, the device must be decontaminated, disinfected, and cleaned as required by the work to be carried out.
Therefore, we ask you to fill in this certificate of decontamination before you start with the required work.

Yours sincerely

KENDRO Laboratory Products GmbH

## Works to be carried out (please mark where applicable)

| | | | |
|---|---|---|---|
| Service | ☐ | Filter replacement | ☐ |
| Repair | ☐ | Relocation | ☐ |
| Calibration | ☐ | Transport | ☐ |

## Declaration of possible contamination (please mark where applicable)

| | | | |
|---|---|---|---|
| The device is clear of biological material | ☐ | The device is clear of dangerous chemical substances | ☐ |
| The device is clear of radioactivity | ☐ | The device is clear of other dangerous substances | ☐ |
| The device is clear of cytostatic agents | ☐ | | |

## Certification:

Prior to carrying out the required work, we have decontaminated, disinfected, and cleaned the device as described in the operating instructions of the device and in accordance with nationally applicable regulations.
The device does not present any hazards.

Note:

Date, legally binding signature, stamp

Kendro®

Internet: http://www.kendro.com